

MULTIRATE SWITCHED-CAPACITOR CIRCUITS FOR 2-D SIGNAL PROCESSING

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Kluwer Academic Publishers

Multirate Switched Capacitor Circuits For 2 D Signal Processing

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Multirate Switched Capacitor Circuits For 2 D Signal Processing:

Multirate Switched-Capacitor Circuits for 2-D Signal Processing Jose E Franca,1997-11-30 **Multirate Switched-Capacitor Circuits for 2-D Signal Processing** Wang Ping,José E. Franca,2012-12-06 Multirate Switched Capacitor Circuits for 2 D Signal Processing introduces the concepts of analog multirate signal processing for the efficient implementation of two dimensional 2 D filtering in integrated circuit form particularly from the viewpoints of silicon area and power dissipation New 2 D switched capacitor SC networks and design techniques are presented both with finite impulse response FIR and infinite impulse response IIR with separable denominator polynomial which offer simpler and more systematic synthesis procedures than currently available design techniques for 2 D analog filters Since they are in the discrete time domain the book can be also referred to the digital multirate signal processing A 2 D SC image processor that realizes both 2 x 2 nd order Butterworth lowpass and highpass filtering functions for video image signals was realized as a prototype integrated circuit implemented in 1 0 μm CMOS technology The experimental characterization of this prototype chip demonstrated the feasibility of real time analog multirate 2 D image processing with equivalent 8 bits accuracy using only 2 5 x 3 0 mm^2 of silicon area and dissipating as little as 85 mW at 5V supply and 18 MHz sampling rate This indicates that for moderate accuracy and low to moderate complexity of the filtering function a fully multirate analog implementation has a potential to achieve a more competitive implementation than an alternative digital VLSI implementation However for high accuracy and or higher processing complexity not only the relative overhead cost of the front end and back end converters will diminish but also the implementation of the processing core in digital VLSI will benefit more of technology scaling to achieve higher density of integration Multirate Switched Capacitor Circuits for 2 D Signal Processing is essential reading for practicing analog design engineers and researchers in the field It is also suitable as a text for an advanced course on the subject

Design of Very High-Frequency Multirate Switched-Capacitor Circuits Ben U Seng Pan,Rui Paulo da Silva Martins,Jose de Albuquerque Epifanio da Franca,2006-07-02 Design of Very High Frequency Multirate Switched Capacitor Circuits presents the theory and the corresponding CMOS implementation of the novel multirate sampled data analog interpolation technique which has its great potential on very high frequency analog frond end filtering due to its inherent dual advantage of reducing the speed of data converters and DSP core together with the specification relaxation of the post continuous time filtering This technique completely eliminates the traditional phenomenon of sampled and hold frequency shaping at the lower input sampling rate Also in order to tackle physical IC imperfections at very high frequency the state of the art circuit design and layout techniques for high speed Switched Capacitor SC circuits are comprehensively discussed Optimum circuit architecture tradeoff analysis Simple speed and power trade off analysis of active elements High order filtering response accuracy with respect to capacitor ratio mismatches Time interleaved effect with respect to gain and offset mismatch Time interleaved effect with respect to timing skew and random jitter with non uniformly holding Stage

noise analysis and allocation scheme Substrate and supply noise reduction Gain and offset compensation techniques High bandwidth low power amplifier design and layout Very low timing skew multiphase generation Two tailor made optimum design examples in CMOS are presented The first one achieves a 3 stage 8 fold SC interpolating filter with 5 5MHz bandwidth and 108MHz output sampling rate for a NTSC PAL CCIR 601 digital video at 3 V Another is a 15 tap 57MHz SC FIR bandpass interpolating filter with 4 fold sampling rate increase to 320MHz and the first time embedded frequency band up translation for DDFS system at 2 5V The corresponding chip prototype achieves so far the highest operating frequency highest filter order and highest center frequency with highest dynamic range under the lowest supply voltage when compared to the previously reported high frequency SC filters in CMOS

Multirate and Multiphase Switched-capacitor Circuits Adam Dabrowski, 1997 Written by an author with extensive practical experience of applying the techniques this book is aimed at advanced students and researchers as well as professional design engineers The text focuses on finite impulse response FIR filter structures and on infinite impulse response IIR SC filters which simulate classical lossless circuits It includes coverage of the so called pseudo lossless SC circuits and especially multirate SC circuits with recovery of the effective pseudo energy There is also discussion of other promising approaches to the design of SC circuits special attention has been paid to the analysis of multirate and multiphase SC circuits using signal flow graphs

Digital Signal Processing in Power Electronics Control Circuits Krzysztof Sozański, 2013-07-03 Many digital control circuits in current literature are described using analog transmittance This may not always be acceptable especially if the sampling frequency and power transistor switching frequencies are close to the band of interest Therefore a digital circuit is considered as a digital controller rather than an analog circuit This helps to avoid errors and instability in high frequency components Digital Signal Processing in Power Electronics Control Circuits covers problems concerning the design and realization of digital control algorithms for power electronics circuits using digital signal processing DSP methods This book bridges the gap between power electronics and DSP The following realizations of digital control circuits are considered digital signal processors microprocessors microcontrollers programmable digital circuits Discussed in this book is signal processing starting from analog signal acquisition through its conversion to digital form methods of its filtration and separation and ending with pulse control of output power transistors The book is focused on two applications for the considered methods of digital signal processing an active power filter and a digital class D power amplifier The major benefit to readers is the acquisition of specific knowledge concerning discussions on the processing of signals from voltage or current sensors using a digital signal processor and to the signals controlling the output inverter transistors Included are some Matlab examples for illustration of the considered problems

Switched-Capacitor Techniques for High-Accuracy Filter and ADC Design Patrick J. Quinn, Arthur H.M. van Roermund, 2007-07-20 This book proposes alternative switched capacitor techniques which allow the achievement of higher intrinsic analogue functional accuracy than previously possible in such application areas as analogue filter and ADC

design The validity of the concepts developed and analyzed in Switched Capacitor Techniques for High Accuracy Filter and ADC Design has been demonstrated in practice with the design of CMOS SC bandpass filters and algorithmic ADC stages

Digital Signal Processing and Statistical Classification George J. Miao, Mark A. Clements, 2002 This is the first book to introduce and integrate advanced digital signal processing DSP and classification together and the only volume to introduce state of the art transforms including DFT FFT DCT DHT PCT CDT and ODT together for DSP and communication applications You get step by step guidance in discrete time domain signal processing and frequency domain signal analysis digital filter design and adaptive filtering multirate digital processing and statistical signal classification It also helps you overcome problems associated with multirate A/D and D/A converters **The Computer Engineering Handbook** Vojin G.

Oklobdzija, 2001-12-26 There is arguably no field in greater need of a comprehensive handbook than computer engineering The unparalleled rate of technological advancement the explosion of computer applications and the now in progress migration to a wireless world have made it difficult for engineers to keep up with all the developments in specialties outside their own Sigma Delta A/D Conversion for Signal Conditioning Kathleen Philips, Arthur H.M. van Roermund, 2006-05-05 1

1 Background Moore's Law predicts a decrease by a factor of two in the feature size of CMOS technology every three years and has been valid for years It implies a doubling of the operation speed and a four times higher transistor count per unit of area every three years The combination leads to an eight times higher processing capability per unit of area This ongoing miniaturization allows the integration of complex electronic systems with millions of transistors Very Large Scale Integration and enables the integration of electronic systems An electronic system A generic picture of an integrated electronic system is shown in Fig 1.1 The heart of the system is the signal processing core This core supports a wide variety of functions such as customization and programmability of multiple applications channel coding the definition of the user interface etc These functions are enabled by DSP a controller CPU and various blocks of memory In advanced ICs these blocks provide almost all signal processing and usually dominate in the overall power and area consumption of integrated systems The huge data rates involved require high speed busses for communication between these blocks A power management unit fuels the system by providing the appropriate supply voltages and currents *1993 IEEE International Symposium on Circuits and Systems*, 1993

High-Speed Photodiodes in Standard CMOS Technology Sasa Radovanovic, Anne-Johan Annema, Bram Nauta, 2006-10-11 High speed Photodiodes in Standard CMOS Technology describes high speed photodiodes in standard CMOS technology which allow monolithic integration of optical receivers for short haul communication For short haul communication the cost aspect is important and therefore it is desirable that the optical receiver can be integrated in the same CMOS technology as the rest of the system If this is possible then ultimately a single chip system including optical inputs becomes feasible eliminating EMC and crosstalk problems while data rate can be extremely high The problem of photodiodes in standard CMOS technology is that they have very limited bandwidth allowing data rates up to only 50 Mbit per second High speed

Photodiodes in Standard CMOS Technology first analyzes the photodiode behaviour and compares existing solutions to enhance the speed After this the book introduces a new and robust electronic equalizer technique that makes data rates of 3Gb/s possible without changing the manufacturing technology The application of this technique can be found in short haul fibre communication optical printed circuit boards but also photodiodes for laser disks Low-Power Low-Voltage Sigma-Delta Modulators in Nanometer CMOS Libin Yao, Michiel Steyaert, Willy M. C. Sansen, 2006-02-06 this book is not suitable for the bookstore catalogue Calibration Techniques in Nyquist A/D Converters Hendrik van der Ploeg, Bram Nauta, 2006-09-13 This book analyses different A/D converter architectures with an emphasis on the maximum achievable power efficiency It also provides an accessible overview of the state of the art in calibration techniques for Nyquist A/D converters The calibration techniques presented are applicable to other analog to digital systems such as those applied in integrated receivers They allow implementation without introducing a speed or power penalty *Wide-Bandwidth High Dynamic Range D/A Converters* Konstantinos Doris, Arthur H.M. van Roermund, Domine Leenaerts, 2006-01-12 IGH SPEED Digital to Analog D/A converters are essential components in digital communication systems providing the necessary conversion of signals encoding information in bits to signals encoding information in their amplitude vs time domain characteristics In general they are parts of a larger system the interface which consists of several signal conditioning circuits Dependent on where the converter is located within the chain of circuits in the interface signal processing operations are partitioned in those realized with digital techniques and those with analog The rapid evolution of CMOS technology has established implicit and explicit trends related to the interface and in particular to the D/A converter The implicit relationship comes via the growth of digital systems First it is a global trend with respect to all interface circuits that increasing operating frequencies of digital systems place a similar demand for the interface circuits The second trend takes place locally within the interface Initially the D/A converter was placed at the beginning of the interface chain and all signal conditioning was implemented in the analog domain after the D/A conversion The increasing flexibility and robustness of digital signal processing shifted the D/A converter closer to the end point of the chain where the demands for high quality high frequency operation are very high **VLSI Modulation Circuits - Signal Processing, Data Conversion, and Power Management** Hongjiang Song, 2014-05-24 This is a textbook developed for a VLSI circuit design course series EEE598 that the author has been offering in the Schools of Engineering at Arizona State University The materials are organized into eighteen special topics covering the principles the circuit design techniques and the applications of VLSI modulation in signal processing data conversion power amplification and power management **CMOS Current-Mode Circuits for Data Communications** Fei Yuan, 2007-04-26 Current mode circuits where information is represented by the branch currents of the circuits rather than the nodal voltages as of voltage mode circuits possess many unique and attractive characteristics over their voltage mode counterparts including a small nodal time constant high current swing in the presence of a low

supply voltage reduced distortion a low input impedance a high output impedance less sensitive to switching noise and better ESD immunity CMOS current mode circuits have found increasing applications in telecommunication systems instrumentation analog signal processing multiprocessors high speed computer interfaces and the backplane of complex electronic systems This book deals with the analysis and design of continuous time CMOS current mode circuits for data communications over wire channels CMOS current mode sampled data networks such as switch current circuits and current mode logic circuits are excluded The book is organized as follows Chapter 1 examines the distinct characteristics of ideal voltage mode and current mode circuits The topology duality of these two classes of circuits is investigated using the concept of inter reciprocity and adjoint network A critical comparison of the input and output impedances bandwidth slew rate propagation delay signal swing supply voltage sensitivity and ESD sensitivity of voltage mode and current mode circuits is provided Chapter 2 investigates design techniques that improve the performance of low voltage current mode circuits including input impedance reduction output impedance boosting bandwidth enhancement mismatch compensation power consumption reduction and swing improvement Chapter 3 investigates the modeling of wire channels

RF Power Amplifiers for Mobile Communications Patrick Reynaert, Michiel Steyaert, 2006-11-18 This book tackles both high efficiency and high linearity power amplifier PA design in low voltage CMOS With its emphasis on theory design and implementation the book offers a guide for those actively involved in the design of fully integrated CMOS wireless transceivers Offering mathematical background as well as intuitive insight the book is essential reading for RF design engineers and researchers and is also suitable as a text book

Analog Circuit Design Techniques at 0.5V Shouri Chatterjee, K.P. Pun, Nebojša Stanic, Yannis Tsiividis, Peter Kinget, 2010-04-02 Analog design at ultra low supply voltages is an important challenge for the semiconductor research community and industry *Analog Circuit Design Techniques at 0.5V* covers challenges for the design of MOS analog and RF circuits at a 0.5 V power supply voltage All design techniques presented are true low voltage techniques all nodes in the circuits are within the power supply rails The circuit implementations of body and gate input fully differential amplifiers are also discussed These building blocks enable us to build continuous time filters track and hold circuits and continuous time sigma delta modulators Current books on low voltage analog design typically cover techniques for supply voltages down to approximately 1V This book presents novel ideas and results for operation from much lower supply voltages and the techniques presented are basic circuit techniques that are widely applicable beyond the scope of the presented examples *Analog Circuit Design Techniques at 0.5V* is written for analog circuit designers and researchers as well as graduate students studying semiconductors and integrated circuit design

Circuits and Systems Tutorials Chris Toumazou, Nick Battersby, Sonia Porta, 1995-12-11 Available for the first time in paperback this ground breaking industry textbook is heralded as a first in its state of the art coverage of the most important areas emerging in circuits and systems It is compiled from course material used in a suite of one day tutorials on

circuits and systems designed expressly for engineers and research scientists who want to explore subjects outside but related to their immediate fields Authored by 50 circuits and systems experts this volume fosters a fundamental and authoritative understanding of each subject **The British National Bibliography** Arthur James Wells,1999

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